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AN EVALUATION OF HIGH SCHOOL MATHEMATICS PROGRAMMED TEXTS WHEN USED WITH DEAF STUDENTS.

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A COMPARISON WAS MADE OF THE RATE AND LEVEL OF ACHIEVEMENT OF 150 DEAF STUDENTS RESULTING FROM THE USE OF PROGRAMED TEXTS AS AGAINST THE USUAL LECTURE METHODS IN HIGH SCHOOL MATHEMATICS. EACH OF FOUR MATHEMATICS TEACHERS HAD TWO COMPARABLE CLASSES. THE CONTROL GROUP RECEIVED INFORMATION BY SIMULTANEOUS LECTURE AND THE EXPERIMENTAL GROUPS USED THE PROGRAMED TEXTS. PRE- AND POST-TESTS WERE ADMINISTERED ALONG WITH SUCH ACHIEVEMENT INSTRUMENTS AS--(1) THE LANKTON 1ST YEAR ALGEBRA TEST, (2) THE BLYTH 2D YEAR ALGEBRA TEST, AND (3) THE SHAYCROFT PLANE GEOMETRY TEST. THE PROGRAMED TEXT CLASSES IN ELEMENTARY ALGEBRA AND PLANE GEOMETRY DID NOT GAIN SIGNIFICANTLY OVER LECTURE METHODS. IN INTERMEDIATE ALGEBRA THE PROGRAMED TEXT WAS FAVORED. THE RAPID LEARNING FACTOR SHOWED THAT IN ALL BUT ONE CASE THE AVERAGE AMOUNT OF TIME REQUIRED FOR THE PROGRAMED CLASSES EQUALLED OR EXCELLED THAT ALLOTTED TO THE LECTURE CLASSES. (HB)

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Cooperative Research Project No. 1633

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Washington, D. C.

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PROBLEM

Over the years, Gallaudet College, the only college in the world for the deaf, has been obliged to offer a year of preparatory instruction to about 85 percent of its students before it could consider admitting them into its freshman class. The casualty rate has been high during the course of this year: from 20 to 40 percent. In recent years the preparatory curriculum has consisted of English, mathematics (elementary algebra, intermediate algebra, and plane geometry), and a science (physics or chemistry). While more effective instruction is desired for the entire preparatory curriculum, this investigation will be concerned solely with the mathematics part of the curriculum.

From one-third to one-half of the preparatory students are required to take elementary algebra, intermediate algebra and plane geometry. The remaining preparatory students are judged ready to begin with intermediate algebra and, after completing that subject, study plane geometry. In short, the students are required to complete from two to three years of high school mathematics in this single preparatory year. Thus, it is not surprising that the newly available programmed textbooks in high school mathematics attracted interest. They gave promise of greater achievement in a shorter period of time than the usual lecture method. What could be more appropriate for this overcrowded and critically important year

of instruction? Moreover, if these materials could effectively improve either the level of achievement and/or the rate at which mathematics could be learned, then programmed texts could be recommended for use by the residential and day schools for the deaf throughout the United States. Indeed, more effective instructional techniques might hasten the day when the college need no longer provide this level of instruction.

Still one other possibility seems worthy of mention in regard to the use of programmed texts. While these materials might not yield more nor faster achievement for the range of deaf students, it is still conceivable that some students might learn more effectively with these materials than from the usual type of lecture course. Of course, the necessary proviso is that there must be some way these students can be identified in advance. Put in another way, if some combination of predictor variables could identify those students who would perform well with programmed materials, they could be profitably isolated from the usual instructional procedures and assigned to work with programmed texts. Although English ability will be considered as a possible predictor in this regard, it is believed that such personality variables as work habits, desire for novelty, and the need for personal recognition may be of greatest predictive value. A more extended discussion of these variables will be given below.

Finally, it has been frequently noted that whenever a new technique, however bad, has been introduced into the

classroom effective results are obtained with it. This has been variously attributed to the "Hawthorne Effect" or to the effect of introducing something novel into the learning situation. This appears to be as important a methodological problem in this as in any other educational setting. Hence, attempts will be made to measure the effect, if any, of the novel features of the materials introduced into the curriculum.

The problems to be solved in this research, therefore, were to compare the rate and level of achievement resulting from the use of programmed texts as against the usual lecture methods in high school mathematics. Additionally, it was hoped that some variables might be isolated which would differentially predict success with these two methods. Finally, it was deemed necessary to assess the reactions of the students to ascertain the effect, if any, of novelty on the course of the experiment.

RELATED RESEARCH

A. Gallaudet Pilot Study

A pilot study in the use of programmed texts in elementary algebra was undertaken at the beginning of the 1961-62 academic year at the College as a prelude to this investigation. Since class schedules were already fixed before the study was designed, a major feature of programmed instruction could not be operative, i.e., allowing each student to complete the course at his own pace. Thus, only the following modest goals

were sought: (1) to ascertain the feasibility of some experimental procedures and instruments and (2) to obtain some preliminary evidence on the efficacy of these same procedures and techniques. The study was also intended to serve as a vehicle for acquainting the math instructors with the programmed text technique of instruction.

Several mathematics tests[1] are used for placement into mathematics courses as well as screening for admission to the preparatory course of study. Based upon past experience, a cut score on the summation of the percentile ranks for these tests was used to assign the lowest 70 students into three elementary algebra classes. This group of 70 students was further broken out into a bottom sixth (a_1), a middle two-thirds (a_2) and the top sixth (a_3) on algebra achievement. Three classes were formed from this distribution.

1. The usual lecture class composed of students exclusively from the a_2 portion of the algebra achievement range.

2. A class which used programmed texts in the classroom. (The programmed texts were also used for homework assignments.) This class was made up of the entire a_1 group and an approximately equal-sized group taken from the a_2 part of the distribution.

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[1] The entrance examination are the Lankton Algebra and the Stanford Arithmetic Achievement Tests. The additional screening tests are the Illinois Algebra Tests, Parts I, II, and III and the Iowa Algebra Aptitude Test.

3. The last group was exposed to lecture quizzes and class discussion in the classroom. All programmed text work was done outside of the classroom. The class was composed of the a_3 portion of the range and an approximately equal sized group from the a_2 pool.

All three classes were of four weeks duration, with four scheduled classroom hours daily. One instructor handled both programmed text classes while the lecture class was taught by a second instructor. The programmed texts used were from the TEMAC series published by the Encyclopedia Britannica.

At the close of the course, experimental comparisons were made between the three a_2 groups which had also been matched on English reading ability.[2] The three matched a_2 groups registered almost identical mean achievement scores on the Lankton and Cooperative Algebra Achievement tests. As might be expected, the two extreme groups (a_1 and a_3) maintained their same relative achievement status.

It was also found that the students requested relatively little help from the instructor during the class hours and that a great majority of the students stated that they liked working with the programmed text.

In summary, the pilot study revealed that programmed texts, even when used under less than optimum conditions, were at

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[2] Reading comprehension was assesssed by summing the percentile scores on the Stanford And STEP reading tests.

least as effective with deaf students as the usual lecture. Many of the instruments devised for the pilot study were found to be feasible. Finally, a considerable amount of subjective information about the use of programmed texts in the classroom was acquired.

B. Other Research

To the best of the writer's knowledge only four other programmed learning experiments have been or are being conducted with deaf students. All of these deal with the acquisition of English by a much younger age group than that of concern here. Those results which have been reported to date do not appear pertinent to this study.

The other seemingly pertinent area of research deals with the efficacy of programmed instruction in the classrooms for the hearing student. It is quite possible that the equivocal findings reported so far for the comparisons between the usual lecture and the programmed text may have no relevance here. Indeed, even if the programmed text proved inferior to the classroom lecture in all of the comparisons made with hearing children, an effectively used programmed text might still be superior to the lecture method for deaf students.

This seeming paradox can be resolved by reference to the description of a lecture to deaf students. It is anything but conventional. At Gallaudet, the "simultaneous method" of instruction is used. The teacher "speaks" and simultaneously signs and spells with his hands and fingers. In essence,

several communication modes are used simultaneously. One is speech reading. Sound is the second mode. Needless to say, only a very tiny amount of information is transmitted by sound. The third and final modality is manual. It is composed of the language of signs and the manual alphabet. The language of signs has a vocabulary of approximately 3000 signs although context will affect the meaning of a given sign. The manual alphabet is isomorphic to the English alphabet. A comfortable rate of finger spelling, however, is only about 60 words per minute. It is the writer's impression that the rate of transmission of information for the simultaneous method is ordinarily somewhat slower than normal speech. Finally, the deaf students cannot take notes except during a pause in the lecture. It would seem that this would further slow down the rate of transmission of information.

It is possible, therefore, that programmed texts may offer little advantage to the hearing student but be highly effective with the deaf student because it may give a greater amount of information over a fixed period of time than the lecture.

OBJECTIVES

To compare the effectiveness of programmed texts against the "usual" lecture method in elementary algebra (both traditional and modern), intermediate algebra, and plane geometry on the basis of (1) relative achievement and (2) time required for that achievement.

To develop paper-pencil measures of personality which will yield differential prediction of success with the programmed or the lecture methods of instruction.

To assess the effects, if any, of the novelty of the programmed materials on student behavior over the school year.

PROCEDURE

A. Sample

Of the 437 applicants who applied for admission to Gallaudet College for the 1962-63 academic year, 157 were accepted as preparatory students. Thirty-seven applicants were admitted directly into the freshman class. The 157 preparatory students were the subjects who participated in this study. These preparatory students come from almost every state in the Union. Their mean age is 19.3 years with an S.D. of 2.4. Entrance requirements remained the same as in previous years.

A further description of the students' achievement in mathematics and in English is given below under Experimental Preparation.

B. Experimental Preparation

1. Teacher

In the school year preceding this study, all four participating teachers had used the programmed texts in class. More specifically, one instructor had used the materials for the equivalent of a one year course, two instructors for two one year courses, and the fourth instructor for the equivalent of four one year courses. In spite of the foregoing or perhaps

because of it, a careful discussion of the intrinsic logic of programmed instruction and its application in the classroom was carried out by the instructors and the writer. The sessions, which met weekly for eight weeks, produced some interesting ideas. For example, the standard arm chair desk was judged much too small for the rather bulky programmed text materials. Special tables were constructed so that the students would have ample room in which to work.

All of the programmed texts to be used in the study were linear programs. The TEMAC programs published by the Encylopaedia Britannica Press were to be used for the traditional courses in elementary and intermediate algebra and plane geometry. The SRA Course I in Modern Mathematics was to be used for the elementary modern algebra course. This kind of program requires that all students study the same material in the same order although each student may proceed through this material at his own rate of speed. The student is requested to write an answer to each frame in the program, and as with all programmed instruction he can immediately determine if his answer is correct. The students were to be encouraged to ask any relevant questions. Finally, a comprehensive series of quizzes developed by the publisher for use with these programs were to be faithfully administered at the appropriate places in the program.

The informal experience of the teachers with programmed text material during the previous year clearly indicated that

a teacher could not manage the clerical burdens involved in administering quizzes in class, grading the quizzes immediately, and tutoring students without some clerical help. Consequently, about a dozen college student assistants were to be trained to function as a teacher's aid in the classroom when the preparatory students worked with the programmed texts. The assistant would administer quizzes, grade them immediately, and record the results for the teacher. The teacher, in turn, could decide whether the student should continue with the next section of the program or repeat the same section. The teacher could also decide to give the student some additional tutoring or reading as the teacher thought appropriate.

The instructors developed a classroom arrangement which would permit some students to work with the programmed texts, others to take a quiz, and still others to receive coaching or tutoring from the instructor without any of these activities interfering one with another. In this regard, it is much easier to carry out these several activities in a single room with deaf students than it would be with hearing students. Sounds do not distract the deaf.

2. Student

All the preparatory students are required to attend a two week orientation program before the beginning of class work. A special session was held with them during the orientation period. The students were asked to answer the questions posed in the Inventory included in the Appendix.

Immediately after the completion of this task, the writer explained the purposes and basic design of the study. He further informed them of the random nature of their assignment to the two different instructional techniques. He stressed that no student would suffer from working with an inferior instructional method. If differences should occur, an appropriate correction would be made to each student's grade.

Other aspects of the study were briefly described and/or demonstrated: the programmed texts, the rating scales and the manner in which they would be used, and, lastly, the difference between traditional and modern mathematics. At the conclusion of the session, the students were encouraged to ask questions about the study.

During this same orientation period, the students were tested on algebra achievement using the Lankton algebra test. The group was then split into high and low algebra achievement halves. Each half was further broken down into four groups with almost identical mean and standard deviation (S.D.) on algebra achievement. The students also were measured on two tests on English ability. The first test was the Inglis Vocabulary Test, and the second was the Gallaudet English entrance examination which has been tailor made for Gallaudet students. The two English test scores were summed, and this sum became the index of a student's English ability. The student protocols containing algebra and English grades were then shuffled back and forth until all four groups were matched on both

Table 1

Initial (Prior to Course Work) English and Algebra Scores of the Four Classes in the LOW Algebra Achievement Groups

Class	Lankton Algebra		Composite English*	
	Mean	S.D.	Mean	S.D.
A (N = 19)	18.9	4.7	91.1	19.6
B (N = 19)	19.2	4.2	90.8	18.8
C (N = 19)	19.0	4.4	89.9	20.7
D (N = 19)	19.0	4.2	91.7	19.7

Table 2

Initial (Prior to Course Work) English and Algebra Scores of the Four Classes in the HIGH Algebra Achievement Group

Class	Lankton Algebra		Composite English*	
	Mean	S.D.	Mean	S.D.
E (N = 20)	34.8	7.3	90.2	19.1
F (N = 20)	34.8	7.4	91.8	24.3
G (N = 20)	34.8	7.4	91.6	24.7
H (N = 20)	34.9	7.8	90.5	25.5

* The Composite English score is the sum of the raw scores on the Inglis Vocabulary Test and the tailor made Gallaudet English Entrance Examination.

algebra achievement and English ability. The same procedure was followed for the four groups in the upper algebra achievement half. The means and S.D.'s for the upper and lower halves are presented in Tables 1 and 2. The groups are so comparable that final raw scores can safely be used to compare relative achievement. It can also be observed that the mean English scores are almost identical for both the high and low algebra achievement groups. This is a consistent finding for Gallaudet preparatory students. Normally this would indicate no need to control or match groups on English. However, the programmed text group presumably would have to read more than the lecture group and this might have an effect on achievement.

C. Basic Design

1. Relative Achievement and Time Required to Reach that Achievement

The essential feature of the design is that each of the four mathematics teachers had two comparable classes. He used the usual lecture method with one class and the programmed text with a matched class. In the latter class he permitted each student to work at his own individual rate of speed. The daily class period was two hours long for both kinds of classes. The same teacher stayed with his two classes throughout the entire school year. When a student in the programmed class was ready for the next course he was administered an achievement examination, given the programmed texts for the

next mathematics course, and encouraged to continue working on that course.

2. Differential Prediction of Success with Instructional Technique

Three seemingly dependent student characteristics seemed appropriate for differential predictions of success with the two kinds of instructional materials. The characteristics seem to involve preferences and attitudes which intuitively appear to be intrinsic to the different instructional methods. The student characteristics are:

a. Work Habits: It was presumed that the student who would do well with programmed materials would prefer to work alone, unsupervised, at his own pace, would like repetition and drill, and would like to know work results immediately.

b. Novelty: It was also thought those who would do better with programmed materials like to do, deal with, or learn NEW things.

c. Need for Recognition: It was believed that the group who would do well with programmed materials would have less need for recognition from teachers and fellow students.

Several thousand inventory items borrowed from the Army Personnel Research Office were scanned for relevance to the above student characteristics and for possible inclusion in the questionnaire. Fifty items were selected, modified slightly, and included in the inventory. An additional 26 items were written for the study. This made 76 items in all.

The final questionnaire can be seen in the Appendix.

The next step taken was to refine the inventory by weeding out those questions which were not really predictive of achievement. The basic method was as follows: The questionnaire had been administered to 70 students who participated in the pilot study. These students became the "selection" sample. The items which differentiated between the selection sample's high and low achiever groups by a P value of 20 percent were included as part of the key to be used in this study. The programmed materials key contained 17 items. Six items were keyed for lecture technique. And seven items were keyed for both instructional techniques.

It should be obvious that the number of subjects used for developing these keys is one-fourth or one-fifth of the number that would be desired for an adequate item analysis. Given the fact that an independent sample would be employed as a check on spurious results, it was judged worthwhile to at least make the effort to develop these inventory keys.

3. Novelty Effects

Each Friday throughout the school year a research assistant from the Office of Institutional Research visited all eight classes. She distributed the rating form shown in Figure 1 to a random group of four students (about 20 percent) in each class. As can be seen from Figure 1, the rating scale calls for the student to indicate how interesting the math instruction had been to him that week and how much of the math

NAME: _____ - 16 - DATE: _____

YOUR FEELINGS ABOUT THE MATH INSTRUCTION THIS WEEK

Please read the two questions on this page. Circle the number which is closest to how you FEEL about the Math instruction THIS WEEK. You can use any of the nine (9) numbers on the line. Do this for both questions. For example, if you feel that the Math instruction was "of great interest", you would circle the number 7 on the A scale. If you feel that you learned more than "a small amount of the math taught", but not really " a reasonable amount", you would circle number 4 on the B scale.

A. How interesting was the Math instruction THIS WEEK?		B. How much of the Math that was taught THIS WEEK did you learn?	
Of very great interest	9	9	Almost all of it
	8	8	
Of great interest	7	7	Most of it
	6	6	
Of reasonable interest	5	5	A reasonable amount of it
	4	4	
Of little interest	3	3	A small amount of it
	2	2	
Of almost no interest	1	1	Almost none of it

YOUR ANSWERS WILL NOT BE SEEN BY YOUR INSTRUCTOR OR THE COLLEGE ADMINISTRATION.

Figure 1. Rating Scales Used by the Students Each Week Throughout the School Year

taught that week did he think he learned. The rating forms were gathered up as they were completed and taken from the room without the teacher having an opportunity to see the ratings. Of course, the instructors had all agreed to this procedure in advance.

Other information gathered was the number of frames completed that week in the programs and the quiz scores achieved that week.

D. Variables

1. Relative Achievement and Time Required to Reach that Achievement

The three prime achievement measures of traditional high school mathematics are part of the Evaluation and Adjustment series. These are the Lankton 1st Year Algebra Test, the Blyth 2nd Year Algebra Test, and the Shaycroft Plane Geometry Test. The two algebra tests are made up of 55 items while the plane geometry test has 60 items. All three tests have a 40 minute time limit. Form Am was administered prior to the beginning of the course. Form Bm was given after the course was completed. The manuals for these tests report coefficients in the mid .80's both for "corrected" split-half estimates and alternate form estimates of reliability.

In the one case where modern mathematics was taught recourse was had to the Cooperative Mathematics Test Algebra I. This also has a time limit of 40 minutes. It has only 40 items, however. The test was designed to be a transitional test be-

tween traditional and modern mathematics and so contains a relatively small number of items which might be described as modern. The manual for the Cooperative Mathematics Test reports reliabilities comparable to those given above. A similar alternate form pattern of testing was employed.

2. Differential Prediction of Success with Instructional Technique

The inventory shown in the Appendix was designed to cover the three general areas of work habits, desire for novelty, and need for recognition. As described above, empirical keys were developed for programmed and lecture forms of instruction.

3. Novelty Effects

The several variables designed to assess novelty effects were:

a. Rated interest in instruction as determined from the nine point rating scale depicted in Figure 1. The scale had adjectival descriptions which ranged from "of very great interest" to "of almost no interest".

b. Rated knowledge was assessed from a companion nine point rating scale on the same form depicted in Figure 1. Adjectival descriptions ranged from "almost all of it" to "almost none of it".

c. The number of frames completed was noted each week for those students using the programmed texts.

d. Weekly quiz scores were ascertained for both

method groups. As described above, the programmed materials include as an integral part a series of objective quizzes. The same quiz items were assembled weekly by the instructor into a test which covered the appropriate week's work for his lecture class.

V. RESULTS

A. Relative Achievement and Time Required to Reach that Achievement

The final achievement test scores for those two classes which took "traditional" elementary algebra are presented in Table 3. It can be seen that the average or mean achievement of these two classes is almost identical ($t = .68$). Essentially similar results are presented in Table 4 for the two classes which studied "modern" elementary algebra. Again no difference in achievement can be cited between the programmed texts class and the lecture class ($t = .67$).

In Table 5 the comparative times that each of the four classes studied elementary algebra is presented. In "traditional" algebra the lecture class was allotted 45 school days for the course. The programmed class, in which each student was permitted to learn at his own pace, averaged out to an almost identical number of school days. As might be expected the S.D. of 12.3 reflects a fairly sizable variation on how long the students took to complete the programmed course.

Turning now to the right side of Table 5 it should be noted that it is headed "Proportion of Course Completed".

Table 3

Final Achievement Test (Lankton) Scores
in TRADITIONAL Elementary Algebra

	Programmed Class	Lecture Class
Mean	27.0	26.7
S.D.	5.9	4.7
N	17	18

Table 4

Final Achievement Test (Cooperative) Scores
in MODERN Elementary Algebra

	Programmed Class	Lecture Class
Mean	21.4	22.4
S.D.	4.8	3.7
N	17	17

Table 5

Amount of Time Spent Studying Elementary Algebra

Number of School Days			Percentage of Course completed	
Programmed Class	Lecture Class		Programmed Class	Lecture Class
45.5	45	Mean	64.0	51.0
12.3	--	S.D.	8.0	--

The instructor teaching the modern algebra course perceived that neither class would complete the course work in a reasonable period of time. He was basically unhappy with student performance in this subject matter. Hence, he had to set an arbitrary stopping point for both classes. The figure in the lecture class column reports the teacher's estimate of how much of the course was covered by the lecture class. In the programmed class column, the mean and S.D. of the actual percentage of the frames completed is presented. These somewhat subjective data seem to indicate that the programmed class covered somewhat more of the course material.

Turning now to the upper ability half of the students the final achievement test scores in traditional intermediate algebra are presented in Table 6. For both teachers the programmed class mean performance slightly exceeded that achieved with the lecture classes. The data summarized in Table 6 were subjected to a two-way analysis of variance (summarized in Table 7) which indicated a statistically significant superiority in the achievement of two programmed classes. No other effects proved to be statistically significant.

In Table 8 the average number of days required for the programmed classes was either about equal to or somewhat longer than that allotted for the lecture classes. The programmed text class which had the highest average number of schooldays and with the most variation in time taken to complete the course also manifested the highest mean achievement. The

Table 6

Final Achievement Test (Blyth) Score in Traditional Intermediate Algebra

Teacher I			Teacher II	
Programmed Class	Lecture Class		Programmed Class	Lecture Class
30.0	26.7	M	27.1	25.8
6.8	5.5	S.D.	7.5	5.5
15	18	N		

Table 7

Analysis of Variance of Traditional Intermediate Algebra Achievement Scores

Source	df	ss	ms	F ratio
Teacher (T)	1	127,999	127,999	2.1
Method (M)	1	290,685	290,685	4.7*
Interaction (TM)	1	199,675	199,675	3.2
Within-Cells	68	4,228,919	62,189	
Total	71	4,847,278	680,548	

* $.05 > P > .01$

Table 8

Number of Schooldays Spent Studying Traditional Intermediate Algebra

Standard for Lecture Class		Programmed Class	
		Teacher I	Teacher II
55	M	56.1	70.5
--	S.D.	2.84	20.4

data suggest that Teacher I may have paced his class. However, he vehemently denied he had made any such attempt. Perhaps the students may have consciously or unconsciously paced themselves. In any event, it was not sufficient to alter the advantage of the programmed text.

The final mathematics course, traditional plane geometry, achievement test results are summarized in Table 9. A two-way analysis of variance of these data (summarized in Table 10) revealed no significant differences in achievement.[3] There were no significant differences in achievement in spite of the fact that the data in Table 11 show that the programmed classes took on the average about 60 percent more school days than the number of days allotted to the lecture class.

B. Differential Prediction of Success with Instructional Technique

The keys intended to predict achievement consisted of (1) a key designed for programmed materials, (2) a key designed for lecture materials and (3) a key for effective performance in both settings. For this analysis, the last key was termed the combined key. This key was added to each of the first two keys making four keys in all. The criteria against

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[3] The Analysis of Variance for all eight classes are presented in Tables A and B in the Appendix. These analyses do not yield different results from these presented in the body of the report.

Table 9

Final Ahcievement Test (Shaycroft) Scores in Plane Geometry

Teacher I			Teacher II	
Programmed Class	Conventional Class		Programmed Class	Conventional Class
30.0	26.7	M	27.1	25.8
6.8	5.5	S.D.	7.5	5.5
15	18	N	15	16

Table 10

Analysis of Variance of Traditional Plane Geometry Achievement Scores

Source	df	ss	ms	F ratio
Teacher (T)	1	49,541	49,541	1.2
Method (M)	1	82,309	82,309	1.9
Interaction (TM)	1	19,101	19,101	.5
Within-Cells	60	2,561,784	42,696	
Total	63	2,712,735	193,647	

Table 11

Number of Schooldays Spent Studying Traditional Plane Geometry

Standard for Lecture Class		Programmed Class	
		Teacher I	Teacher II
50	M	77.7	82.5
--	S.D.	21.2	8.9

which these four keys were correlated were final raw score, observed gain score, and estimated true gain score[4] for both the Blyth Algebra Test and the Shaycroft Geometry Test.

The means and S.D.'s of the intercorrelations of these variables for the four programmed classes are presented in Table 12. The requisite conditions for differential prediction in this table would be reflected by a high mean correlation for the programmed key and no relationship for the lecture key. The actual statistics indicate a very low relationship for both keys. The addition of the common items to the unique keys fails to change the level of correlation appreciably.

In Table 13 a similar array of statistics is given for the four lecture classes. This time the mean correlation of the lecture key should be high while the programmed key should optimally have about a zero relationship. Again the desired conditions do not obtain. The mean correlations are not different from one another or from zero for that matter. And again the addition of the common items adds nothing to the level of prediction. It is apparent, therefore, that the empirical keys developed to predict differential effectiveness with the two instructional techinques failed to do so. In-

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[4] The estimated true gain was computed from a formula presented by McNemar (4) which is a modification of Lord's (3) derivations. Unfortunately, no final choice between the formulas proved to be necessary for the analyses reported herein.

Table 12

Means and S.D.'s of Correlations Between Predictor Keys and Raw Final, Observed Gain, and True Gain Scores on the Blyth and Shaycroft Tests for the PROGRAMMED Group

	Programmed Predictor Key		Lecture Predictor Key	
	Mean	S.D.	Mean	S.D.
Unique Items	.07	.05	.12	.07
Unique and Common Items	.06	.03	.11	.11

Table 13

Means and S.D.'s of Correlations Between Predictor Keys and Raw Final, Observed Gain, and True Gain Scores on the Blyth and Shaycroft Tests for the LECTURE Group

	Programmed Predictor Key		Lecture Predictor Key	
	Mean	S.D.	Mean	S.D.
Unique Items	.12	.04	.09	.04
Unique and Common Items	.08	.04	.03	.05

deed, the keys failed to predict at all. This was also true for the composite English score as well. The full intercorrelation matrices for these data are shown in Tables C and D in the Appendix. The average N for each entry is about 60.

These totally disappointing results were obtained with the keys developed from student responses in the pilot study. Another attempt was made to develop new keys, using only the subjects available in this year's study. The essential rationale followed was that of the double cross-validation. New keys were developed from an item analysis performed with each half of the sample which took the programmed course. A parallel analysis was also carried out for the lecture group. When these empirical keys were crossed to the alternate appropriate halves of the samples, the result was as disappointing as for the previous analysis. The correlations randomly scattered around zero. In short, the items which were selected and/or written for the purpose of predicting success with the programmed or lecture materials proved to be completely ineffective for that purpose.

C. Novelty Effects

It will be recalled that a random sample of about 20 percent of the students in both the programmed and lecture classes was asked to rate (1) how interesting the math instruction was during the previous week and (2) how much they learned during the previous week. The ratings were made on nine point scales with nine being the maximum, one being the

least, and five about the average. Additionally, weekly quiz scores and the number of frames completed each week were collected and recorded. A summary of these statistics is presented in Table 14. Figures 2 through 5 are based upon the statistics included in this table.

The means of the weekly interest ratings are presented graphically in Figure 2. Rated interest begins at a relatively high level for both instructional groups. There is slightly more interest expressed by the programmed group during the first several weeks. After that both curves tend toward the moderate interest interval, and it becomes rather difficult to distinguish between the two. There is a sharp rise after the return from the Christmas recess for both techniques which appears again only for the lecture group after the Spring recess. There also seems to be a drop-off in interest toward the close of the school year for the programmed group which is not quite paralleled by the interest curve for the lecture class.

Turning now to the rated knowledge, a parallel analysis of the weekly mean knowledge scores is presented graphically in Figure 3. Examination of the curves in Figure 3 yields little reason to presume that the students in the programmed group felt they learned more or less than those in the lecture group. The curves of rated knowledge seem somewhat flatter than those obtained for rated interest. There is, however,

Table 14

Means of Weekly Measurements Taken Each Week of the School Year

Week	Programmed Group Means				Lecture Group Means		
	Number of Frames Completed	Quiz Scores	Rated Knowledge	Rated Interest	Rated Knowledge	Rated Interest	Quiz Scores
1	1115	78	6.8	6.3	6.8	6.3	64
2	723	74	5.4	6.3	6.4	5.8	75
3	547	77	6.4	6.1	6.4	6.4	72
4	619	74	6.6	6.7	5.6	5.8	67
5	498	68	6.1	5.8	5.1	5.4	64
6	370	73	6.1	6.0	5.5	5.6	57
7	458	70	5.9	6.0	5.4	5.6	65
8	448	71	5.9	5.9	5.6	5.4	71
9	468	76	5.8	6.3	5.4	5.4	53
10	CHRISTMAS VACATION						
11	400	72	5.3	4.9	4.6	4.4	57
12	859	85	6.8	6.8	5.2	6.8	28
13	453	80	6.2	5.5	6.6	6.5	73
14	416	79	6.1	5.6	5.6	5.8	72
15	281	79	5.4	5.1	4.8	5.5	64
16	267	79	5.5	5.1	5.4	4.9	64
17	589	68	6.2	5.9	4.9	5.1	53
18	395	79	5.9	5.5	5.9	6.1	61
19	441	79	5.5	5.3	5.0	4.9	60
20	444	76	5.1	4.9	4.5	4.7	38
21	565	76	5.8	5.6	5.2	5.3	62
22	513	83	5.6	5.2	5.1	5.0	55
23	669	87	5.6	5.3	6.8	7.0	53
24	502	78	4.9	4.9	5.3	5.2	67
25	SPRING VACATION						
26	362	83	5.6	5.4	5.6	5.8	66
27	465	78	5.4	5.3	4.9	5.1	60
28	423	80	5.4	5.0	4.9	5.3	67
29	592	71	5.0	4.3	6.1	5.6	60
30	1043	58	4.4	3.9	4.9	5.2	60

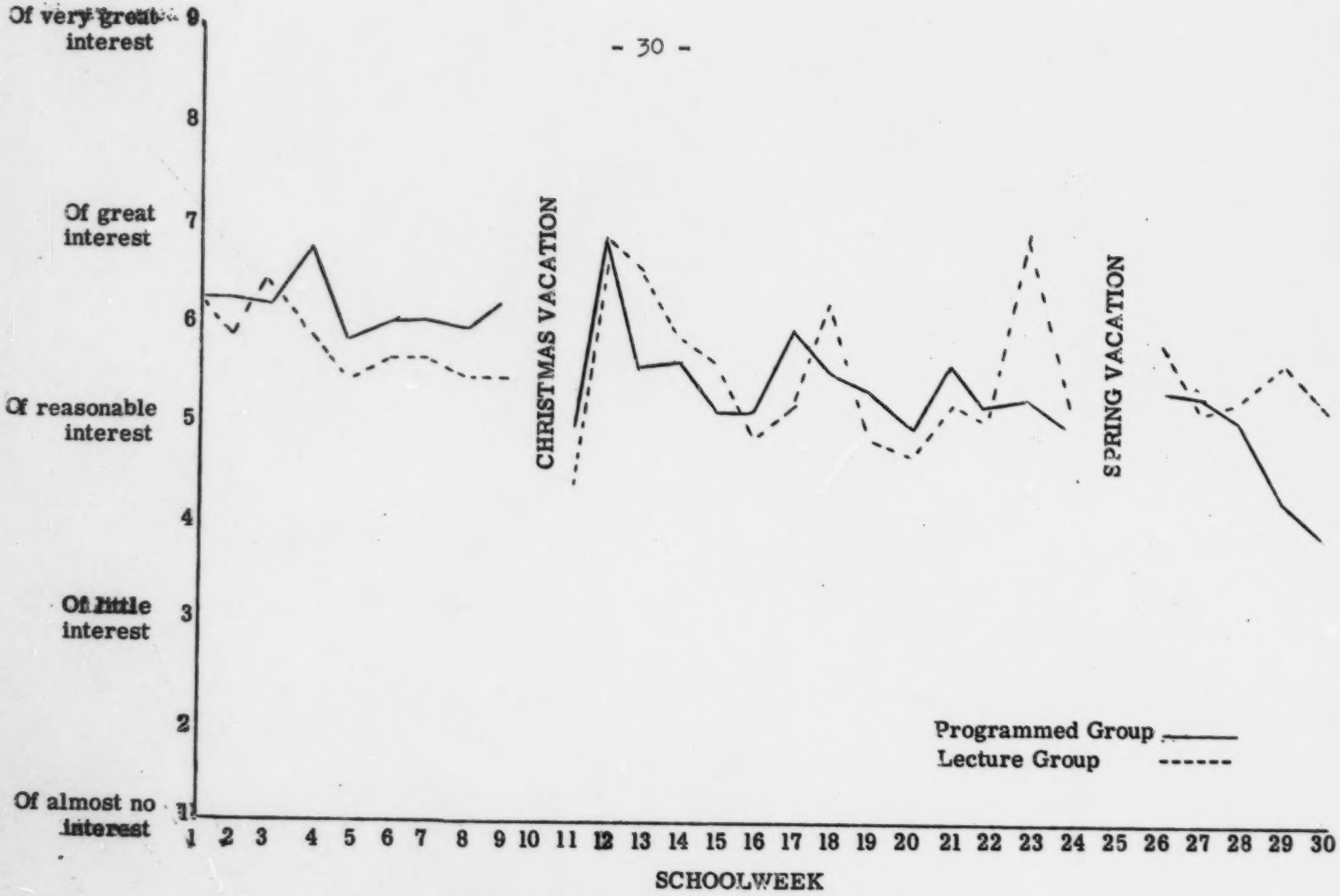

Figure 2. Mean Weekly Rated Interest in Instruction for Each Week of the School Year

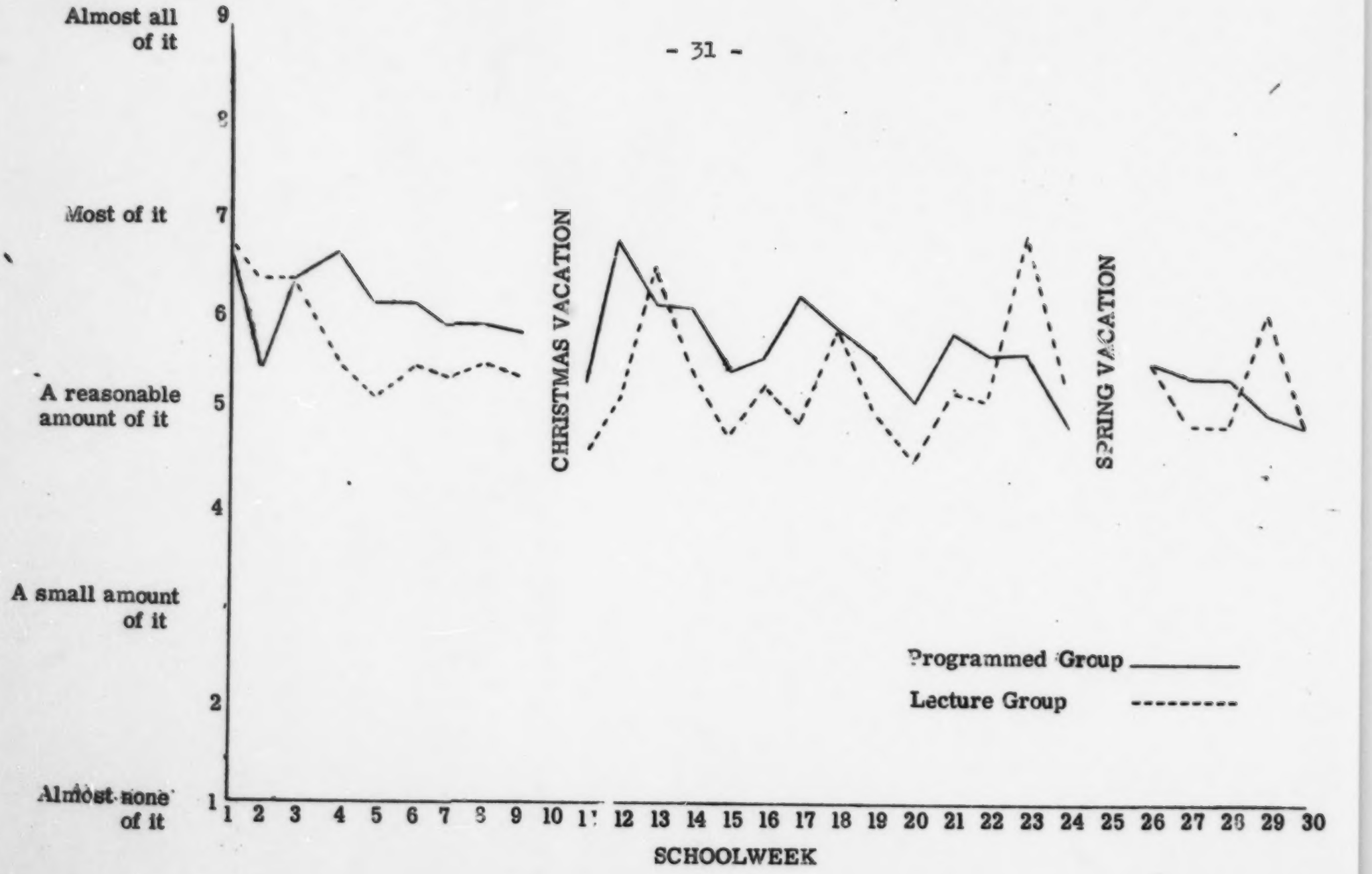
Almost all of it
9
Most of it
7
A reasonable amount of it
5
A small amount of it
2
Almost none of it
1
CHRISTMAS VACATION
SPRING VACATION
Programmed Group
Lecture Group
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
SCHOOLWEEK

Figure 3. Mean Weekly Rated Knowledge Gained from Instruction for Each Week of the School Year

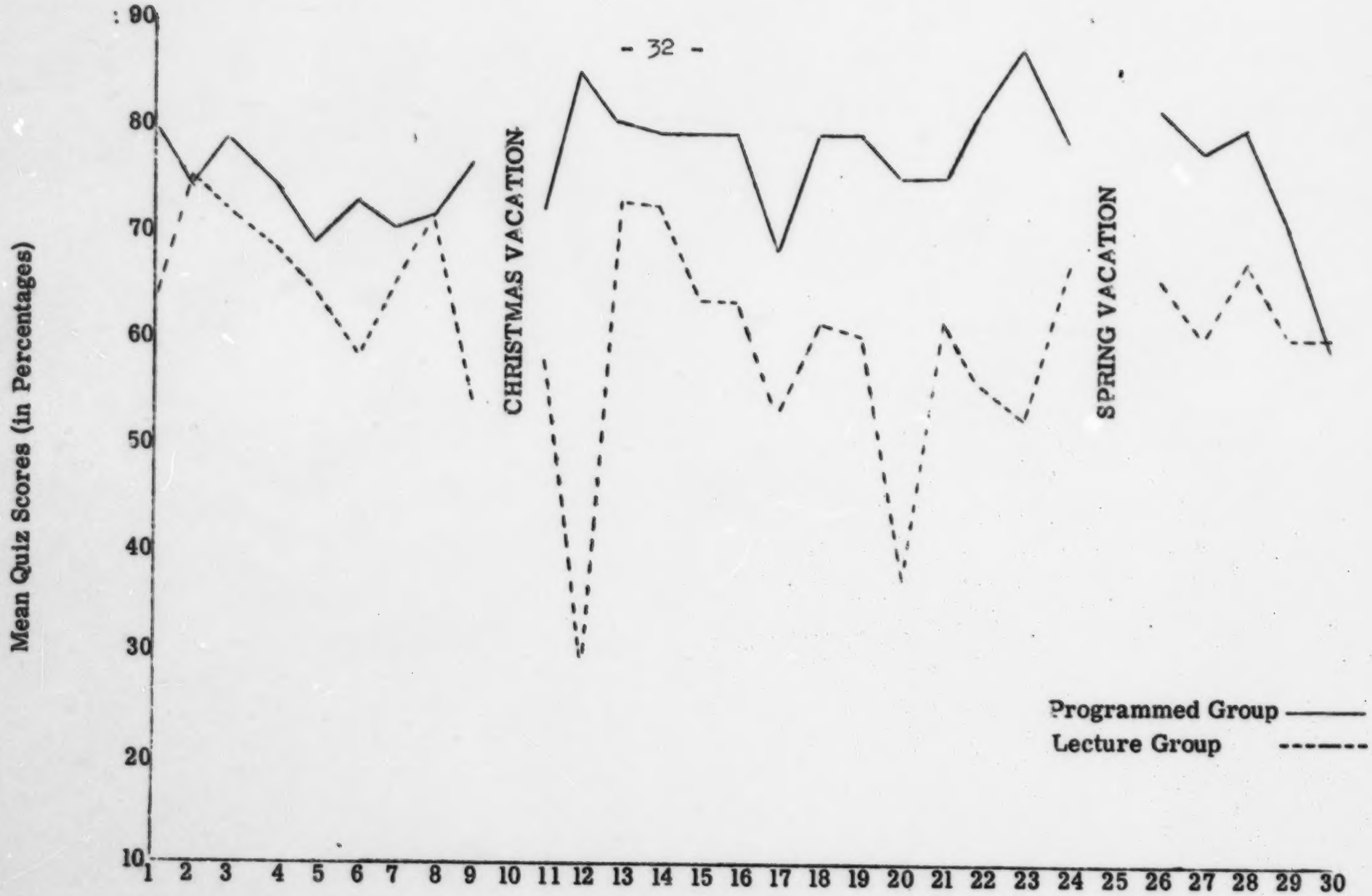

Figure 4. Mean Scores (in Percentages) for Each Week of the School Year

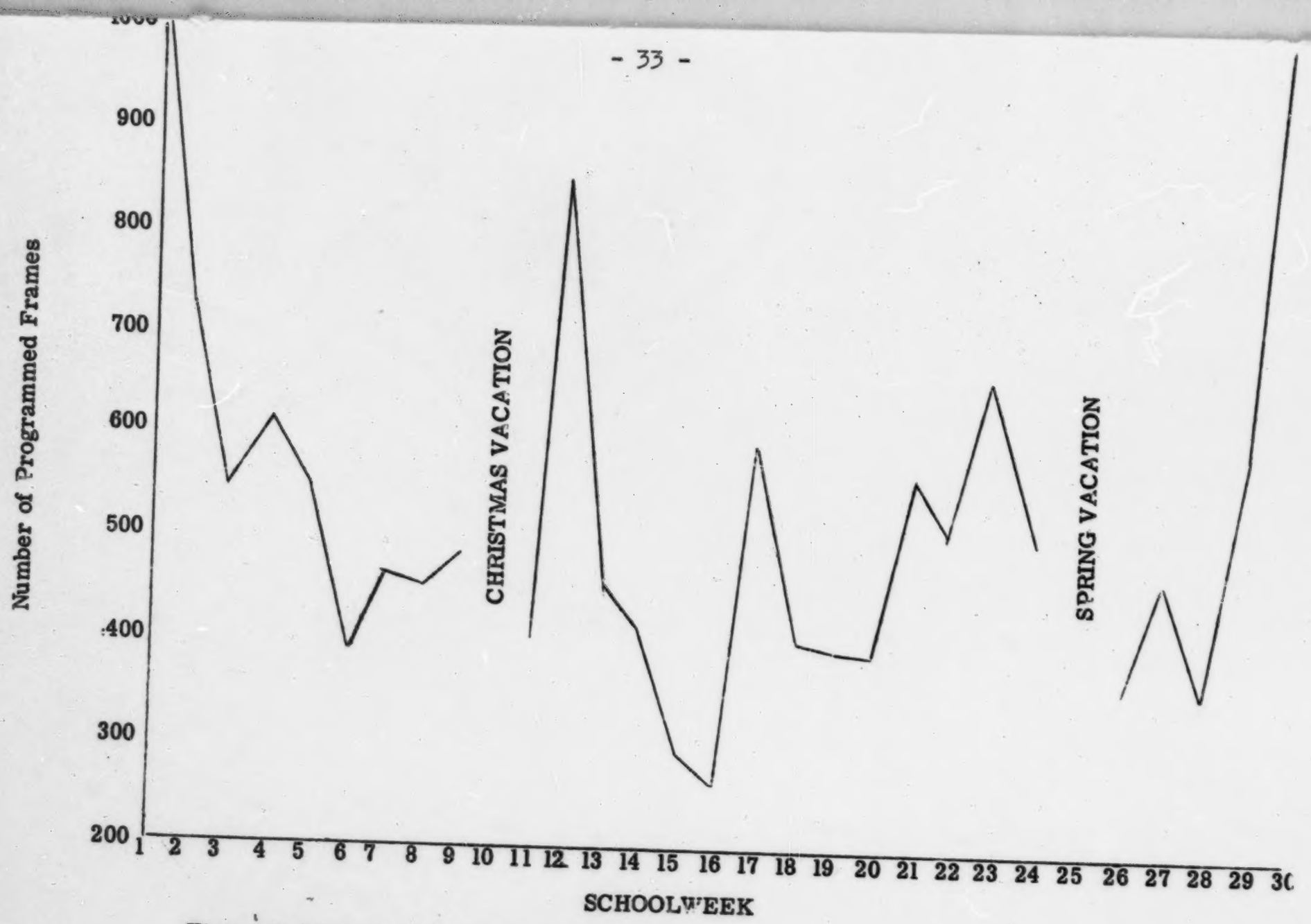

Figure 5. Mean Number of Programmed Frames Completed by the Programmed Classes for Each Week of the School Year

a similarity in that rated knowledge is relatively high at the beginning of the year with a fall-off tending to the "neutral" position on the rating scale, i.e., "a reasonable amount". Slight risès in rated knowledge are also manifested immediately after the vacation periods.

A similar analysis of the weekly quiz grades is illustrated in Figure 4. The curves are rather erratic over the school year. However, the quiz scores for the programmed groups are consistently above the lecture group. This can be explained in two ways: First, the quiz items came with the programmed materials. Second, students in the programmed class were permitted to take a second or third quiz if they did poorly. This explanation seems consistent with the fact that in the major analysis of achievement scores above, only intermediate algebra manifested a significant difference in favor of the programmed group.

The final set of data collected from the classroom consisted of a count of the number of frames completed by the students in the programmed classes. This is shown in Figure 5. It would seem that "amount of work" is subject to the widest fluctuation of all the measures taken in the classroom. (It will be remembered that these are simple sums of number of frames completed without regard to place in the program.)

Again changes in performance appear most easily explained by calendar events: the beginning and end of the school year and immediately after vacations. Of interest is the seeming

spurt in number of frames completed during the last weeks which contrasts with the slight drops in rated interest and knowledge. Undoubtedly, the teachers urged the students to complete the programs.

The relationships between the four different measures of performance, rated interest, rated knowledge, number of frames complete, and quiz scores, were computed for each week throughout the year. The correlations obtained each week of the school year is included in Tables E and F in the Appendix. The means and S.D.'s of these correlations for the programmed and the lecture group are summarized in Tables 15 and 16, respectively. As might be expected the mean correlations between the two ratings, interest and knowledge, is fairly high. For the programmed group the mean relationship is .70. The mean for the lecture group is .64. The mean of the intercorrelations of the remaining measures, however, is in the low .30's. Certainly this level of relationship does not inspire a great deal of confidence in the students' opinions of how much they learned.

In any event, none of these analyses seem to indicate that the novelty of a new instructional technique such as the linear programmed text had a lasting or an enduring effect on students' learning when their performance over an entire school year was measured.

Table 15

Means and S.D.'s of Intercorrelations Computed Between Weekly Measurements for the 30 Weeks in the School Year for the PROGRAMMED Group

	Rated Interest	Rated Knowledge	Quiz Scores	No. of Frames Completed	
Rated Interest		.74	.34	.28	M
Rated Knowledge	.16		.37	.29	E
Quiz Scores	.19	.23		.34	A
No. of Frames Completed	.16	.16	.19		N
					S

STANDARD DEVIATIONS

Table 16

Means and S.D.'s of Intercorrelations Computed Between Weekly Measurements for the 30 Weeks in the School Year for the LECTURE Group

	Rated Interest	Rated Knowledge	Quiz Scores	
Rated Interest		.66	.31	M
Rated Knowledge	.24		.35	E
Quiz Scores	.22	.21		A N S

STANDARD DEVIATIONS

CONCLUSIONS

A. Relative Achievement and Time Required for That Achievement

On the average, the programmed text classes manifested no more achievement than the lecture classes in elementary algebra (in both traditional and modern versions) and plane geometry. The programmed text classes did show a small but significantly greater achievement in intermediate algebra.

Insofar as more rapid learning is concerned, programmed texts also proved disappointing. In all but one case the average amount of time required for the programmed classes equalled or exceeded that allotted to the lecture classes. The one case where this did not occur (modern elementary algebra) involved a fairly subjective indice of rate.

It was apparent before the investigation began that programmed texts have some disadvantages:

1. They are relatively cumbersome.
2. They are more expensive than traditional books.
3. Student assistants seemed necessary for effective use.

Given these short-comings, it seems apparent that using these materials should have provided a clear-cut advantage over the conventional lecture. It is quite obvious they did not do this either in the average level of achievement reached or in the average amount of time taken to complete a given course of study. Only one potential advantage may remain.

Some students do complete the programmed materials prior to an allotted standard time. What about the possibility of identifying these students before they even begin to use the programmed materials?

B. Differential Prediction of Success with Instructional Techniques

Empirically developed keys on questionnaire items intended to assess work habits, reaction to novelty, and need for recognition failed to relate differentially to success with the programmed or lecture materials. Indeed, the keys failed to relate at all with successful achievement. English ability, as measured by a combined vocabulary test and a special English examination used at the College also failed to relate to achievement in intermediate algebra or plane geometry. Although these item analyses suffered badly from the relatively small number of cases used in this study, there is no reason to assume that better or more desirable results would be achieved with a larger number of students.

C. Novelty Effects

An assessment of the rated interest and knowledge of the students coupled with objective indices of the amount of work performed, (as indicated by the number of frames completed) and quality of work performed, (as indicated by the weekly quiz scores) suggests that at very best there is a slight increment of interest in the programmed materials which is rather quickly dissipated after the passage of only

a few school weeks. In fact, the largest variation in student performance seems more clearly related to vacation breaks and the beginning and close of the school year than to other variables. In short, if novelty affected learning at all, it did not affect it for very long.

The findings of the relatively low relationships, about .30, between rated student interest and knowledge and objective quiz scores and counts of work performed implies that the querying of students as to their interest in a new technique may not be of much value for predicting their actual learning performance. Certainly a single time sample of student opinion as is commonly found in many studies should be viewed as having only limited value.

In conclusion, negative results such as found in this study can always be changed by the utilization of new and better techniques. The writer believes, however, that the linear programmed texts used in this study were given every opportunity to manifest superiority over the lecture method. Given the fact that this did not prove to be the case strongly suggests to the writer that any new linear programmed texts be clearly and markedly superior in some well defined manner to those used in this study before meriting additional consideration.

REFERENCES

1. Cook, D. L. The relation of possible Hawthorne effect components to stages of experimental investigation. Occasional Paper 63-133, Bureau of Educational Research and Service, Columbus, Ohio, 1963, Pp. 14

2. Harris, C. W. (Ed.) Problems in measuring change. Madison. Univ. of Wisconsin Press, 1963, Pp. 259

3. Lord, F. M. The measurement of growth. Educ.psychol. Measmt., 17, 1957, 421-437.

4. McNemar, Q. On growth measurement. Educ. psychol. Measmt., 18, 1958, 47-55

5. Roy, H. L., Schein, J. D., and Frisina, D. R. New methods of language development for deaf children. Cooperative Research Project No. 1383, 1964, Pp. 77.

6. Stolurow, L. M. Teaching by machine. Cooperative Research Monograph No. 6, Washington, D. C., U.S.Office of Education, HEW, 1961, Pp. 173

7. Stuckless, E.R. and Birch, J. W. A programmed approach to written language development in deaf children. Volta Rev., 64, 1962, 415-416

APPENDIX

Table A

Analysis of Variance of Traditional Final Intermediate Algebra Achievement Scores for Eight Classes and Four Teachers

Source	df	ss	ms	F ratio
Teacher and Achievement Level (TAL)	3	3,285,997	1,095,332	24.8**
Method (M)	1	343,930	343,930	7.8**
Interaction (MTAL)	3	498,967	166,322	3.8*
Within-cells	125	5,510,340	44,082	
Total	132	9,639,234	1,649,666	

Table B

Analysis of Variance of Traditional Final Plane Geometry Achievement Scores for Eight Classes and Four Teachers

Source	df	ss	ms	F ratio
Teacher and Achievement Level (TAL)	3	750,656	250,218	7.1**
Method (M)	1	7,026	7,026	.2
Interaction (MTAL)	3	118,950	39,650	1.1
Within-cells	113	3,979,385	35,215	
Total	120	4,856,017	332,109	

* $.05 > P > .01$
** $P < .01$

Note: The first source in both of these tables, Teacher and Achievement level, is a confounded source or treatment. It should be remembered that the students were divided into high and low achievers prior to the beginning of the experiment and assigned to different teachers for the entire school year. It is not surprising, therefore, that this split remains a highly significant source of variation in achievement.

Table C

Intercorrelation Matrix Between Predictor Keys and Raw Final, Observed Gain, and True Gain Scores on the Blyth and Shaycroft Tests for the PROGRAMMED Group

		Predictor Keys			Blyth			Shaycroft			
		Prog.	Lect.	Prog. and Common	Lect. and Common	Observ. Gain	True Gain	Raw Final	Observ. Gain	True Gain	Raw Final	Eng. Comp.
Predictor	Prog.		.13	.86	.10	.07	.04	.01	.10	.03	.16	.03
	Lect.			.10	.70	.07	.07	.06	.16	.25	.10	.05
	Prog. and Common				.46	.09	.08	.06	.01	.07	.07	.04
	Lect. and Common					.01	.00	.01	.22	.30	.03	.05
Blyth	Observ. Gain						.93	.80	.38	.26	.54	.10
	True Gain							.96	.32	.18	.66	.08
	Raw Final								.22	.08	.67	.04
Shaycr.	Observ. Gain									.89	.48	.04
	True Gain										.32	.16
	Raw Final											.19
	Eng. Comp.											

Table D

Intercorrelation Matrix Between Predictor Keys and Raw Final, Observed Gain, and True Gain Scores on the Blyth and Shaycroft Tests for the LECTURE Group

Predictor		Prog.	Lect.	Prog.and Common	Lect.and Common	Blyth Observ. Gain	Blyth True Gain	Blyth Raw Final	Shaycroft Observ. Gain	Shaycroft True Gain	Shaycroft Raw Final	Eng. Comp.
	Prog.		.17	.82	.21	.14	.15	.14	.13	.13	.05	.00
	Lect.			.11	.74	.06	.12	.16	.05	.04	.09	.15
	Prog.and Common				.22	.09	.06	.04	.12	.14	.03	.01
	Lect.and Common					.01	.00	.00	.02	.00	.15	.09
Blyth	Observ. Gain						.91	.73	.21	.17	.37	.34
	True Gain							.95	.18	.13	.48	.25
	Raw Final								.14	.08	.50	.13
Shaycr.	Observ. Gain									.99	.46	.09
	True Gain										.34	.07
	Raw Final											.22
	Eng.Comp.											

Table E

Intercorrelations Between the Four Weekly Measurements for Each of the 30 Weeks in the School Year for the PROGRAMMED Group

	CORRELATIONS BETWEEN					
Week	Int. and Know.	Int.and No. of Frames	Int.and Quiz Scores	Know.and No. of Frames	Know.and Quiz Scores	Quiz Scores and No.of Frames
1	.61	.38	.14	.41	.14	.36
2	.50	.01	.37	.35	.09	.24
3	.60	.42	.06	.31	.24	.37
4	.39	.03	.04	.20	.26	.60
5	.81	.34	.78	.34	.72	.27
6	.26	.07	.15	.43	.29	.14
7	.92	.45	.60	.44	.57	.25
8	.93	.12	.23	.07	.10	.49
9	.73	.43	.54	.17	.16	.33
10			CHRISTMAS VACATION			
11	.74	.25	.73	.13	.57	.31
12	.56	.35	.49	.58	1.00	.43
13	.78	.33	.22	.39	.27	.23
14	.79	.42	.29	.49	.29	.43
15	.84	.09	.24	.05	.03	.26
16	.87	.16	.62	.06	.27	.28
17	.72	.38	.12	.34	.49	.02
18	.92	.19	.46	.22	.50	.07
19	.93	.10	.33	.10	.22	.75
20	.87	.44	.10	.18	.16	.32
21	.76	.20	.52	.29	.69	.03
22	.77	.33	.32	.33	.46	.35
23	.75	.07	.27	.02	.30	.48
24	.75	.24	.47	.40	.65	.61
25			SPRING VACATION			
26	.80	.46	.12	.60	.34	.45
27	.92	.25	.38	.25	.53	.52
28	.73	.21	.19	.23	.07	.02
29	.71	.44	.25	.49	.43	.63
30	.78	.69	.45	.28	.50	.32

Table F

Intercorrelations Between the Three Weekly Measurements for Each of the 30 Weeks in the School Year for the LECTURE Group

Week	CORRELATIONS BETWEEN Interest and Knowledge	Interest and Quiz Scores	Knowledge and Quiz Scores
1	.27	.58	.55
2	.42	.19	.32
3	.77	.61	.41
4	.03	.31	.00
5	.79	.80	.63
6	.32	.25	.63
7	.77	.00	.22
8	.68	.52	.37
9	.83	.27	.11
10		CHRISTMAS VACATION	
11	.73	.15	.08
12	.97	.55	.34
13	.93	.49	.57
14	.86	.31	.20
15	.63	.08	.22
16	.74	.10	.10
17	.92	.46	.52
18	.69	.10	.06
19	.00	.07	.08
20	.44	.02	.61
21	.69	.21	.00
22	.75	.38	.41
23	.80	.03	.09
24	.14	.16	.65
25		SPRING VACATION	
26	.61	.13	.27
27	.86	.18	.43
28	.71	.27	.59
29	.74	.70	.76
30	.78	.66	.44

Please fill in:

YOUR NAME _____

Gallaudet College is trying to find out which students learn well with programmed textbooks. We would like you to answer all of the questions on the next three pages. We will relate your answers to how well you learn mathematics during this school year.

Your answers will go directly to the Office of Institutional Research.

Your answers will not be shown to the college faculty or administration.

Your answers will not affect your grades or your entrance to the freshman class.

On the following pages, there are a number of sentences which describe something about yourself. Read each sentence carefully. Then decide whether or not the sentence usually applies to you.

If it does usually apply, put a ✓ mark in the "Applies to me" column.

If it does not usually apply to you, put a ✓ mark in the "Does not apply to me" column.

Make sure your answer sheet has a ✓ mark after every sentence in the form.

If you do NOT understand a sentence call one of us, and we will explain the sentence to you.

		APPLIES TO ME	DOES NOT APPLY TO ME
1. I want to know right away if I have done a good job.	1.		
2. I can't sit still for long.	2.		
3. I have trouble fitting in with a new group of students.	3.		
4. I usually do what I am told to do.	4.		
5. It takes me a long time to catch on to a new task.	5.		
6. Criticism or scolding hurts me terribly.	6.		
7. I always do what everybody tells me to do.	7.		
8. I try to learn from my mistakes	8.		
9. Routine jobs don't bother me much.	9.		
10. I don't care what the other students think about me.	10.		
11. I'm a little slow in following instructions.	11.		
12. I become bored easily.	12.		
13. I need to be noticed by the teacher to learn well.	13.		
14. I get along well with other students.	14.		
15. I don't accept new ideas easily.	15.		
16. I can't learn unless I work on problems all of the time.	16.		
17. I feel bad if someone does not approve of what I do in class.	17.		
18. I work fastest when I work alone.	18.		
19. I am bored by most classroom lectures.	19.		
20. The rest of the students feel comfortable and at ease with me.	20.		
21. I work at a problem until I solve it.	21.		
22. The best way to get along with people at the school is to cooperate with them.	22.		
23. I don't like to read most textbooks.	23.		
24. I am bored most of the time.	24.		

	APPLIES TO ME	DOES NOT APPLY TO ME
25. I have lots of patience. 25.		
26. Learning isn't much fun. 26.		
27. I can't stand criticism from fellow students. 27.		
28. Nothing discourages me for long. 28.		
29. I can meet the requirements of any class. 29.		
30. I'm not good for jobs that require patience. 30.		
31. I like getting the right answer to a problem. 31.		
32. I work best with teachers who don't critize my work. 32.		
33. I'm able to work on my own. 33.		
34. I like doing things without planning for them. 34.		
35. Long explanations don't help me learn very well. 35.		
36. I dislike having teachers pick out things I have done wrong. 36.		
37. I work better when I have to beat someone. 37.		
38. I don't like the teacher to call on me in class when I don't know the answer. 38.		
39. I can't work unless I like what I am doing. 39.		
40. I hate interruptions in my work. 40.		
41. I often start things I never finish. 41.		
42. I try to do my job in a way that brings respect from others. 42.		
43. I keep at a job until it is finished. 43.		
44. I am doing things all the time. 44.		
45. I learn better when my classmates can see me answer in class. 45.		
46. I work better without planning my work. 46.		
47. I cannot stay with the same task for long. 47.		
48. I have to have things explained to me several times. 48.		

	APPLIES TO ME	DOES NOT APPLY TO ME
49. I don't like to figure things out for myself. 49.		
50. I frequently find myself reading the same page over and over. 50.		
51. I don't like to take chances. 51.		
52. I get fed up with a job quickly when things go wrong. 52.		
53. I try to make good first impressions. 53.		
54. I get bored when I have to work alone. 54.		
55. I'll try anything once. 55.		
56. I like the teachers to think I am not like everybody else. 56.		
57. I would like a job that requires close, exacting work. 57.		
58. I always play it safe. 58.		
59. I hate to admit making a mistake. 59.		
60. I don't care about excitement. 60.		
61. I really only work for a good grade. 61.		
62. I always finish everything I start. 62.		
63. I get tired of any job after awhile. 63.		
64. I don't mind routine clerical work. 64.		
65. Homework doesn't really help me learn very well. 65.		
66. I like to work on several different things at one time. 66.		
67. I like to travel to new places. 67.		
68. I am only interested in those subjects which are useful to me. 68.		
69. Most rules and regulations are unnecessary. 69.		
70. I like to have everything arranged just right. 70.		
71. I don't mind if things are disorganized. 71.		

		APPLIES TO ME	DOES NOT APPLY TO ME
72. I don't like anyone telling me what to do.	72.		
73. I don't like to try new things.	73.		
74. I'm clumsy and awkward in my movements.	74.		
75. I don't do anything I haven't thought about carefully.	75.		
76. I like to have someone I can go to for help with my studies.	76.		

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